[13509/2]

SANDING APPARATUS FOR A SANDING MACHINE

FIELD OF THE INVENTION

The present invention relates to a sanding device for a sanding machine, which may include a carrier, a sanding element and at least two coupling elements with which the sanding element is coupled to the carrier, wherein a movable connection is provided between the sanding element and the carrier.

BACKGROUND INFORMATION

Such a sanding device is described in PCT International Published Patent Application No. WO 96/34721. In this sanding device, a sanding element is connected via two pivot arms to a carrier which is releasably connected to the sanding sole of a sanding machine. The sanding element consists of a flexible support plate with pads to which a piece of sandpaper is fixed. On one side the pivot arms are mounted pivotally on the support plate and on the other arranged slidably in slotted holes in the carrier. The ends of the pivot arms can be fixed in the slotted holes via nuts. For sanding purposes the curvature of the support plate is adjusted as desired by sliding the pivot arm ends in the slotted holes and fixed in place by tightening the nuts. The sanding element thus has a fixed position during sanding.

A drawback of this sanding device is that it may be a relatively complex construction, while the degree of flexibility may be very limited, particularly during sanding of surfaces with a radius of curvature.

SUMMARY

An example embodiment of the present invention may provide a sanding device, the construction of which is simpler

and more suitable for sanding surfaces with different radii of curvature.

Ends of the coupling elements coupled to the sanding element may move relative to each other during sanding.

The coupling elements only support the sanding element at the ends. In the center of the sanding element, the sanding element is not supported, so that it is sufficiently flexible. Because these ends of the coupling elements may move relative to each other, the radius of curvature on the surface for sanding may be adjusted during sanding.

The coupling elements may themselves be flexible in order to provide the desired movement. It is, however, also possible for the coupling elements to be hingedly connected to the carrier. Both variants may also be combined.

The device may include a device for urging the coupling elements apart at least at the position of the sanding element. An additional tensioning force is hereby generated in the sanding element, whereby the normal force to be exerted by the sanding element, and thereby the sanding force, is greater.

Since it is expected that in practice such a sanding device will usually be used to sand round surfaces such as pipes, it is attractive when the sanding surface may curve in accordance with a cylinder, this being facilitated by the measure that the sanding element is connected to two coupling elements and that the connecting lines between the coupling elements on the one hand and the sanding element on the other extend substantially parallel.

The sanding element may include a flexible supporting element connected fixedly to the coupling elements, for the purpose of supporting a sheet of sandpaper for connecting thereto. The supporting element connected fixedly to the coupling elements is, for example, formed by a piece of fabric or other flexible material, which may be provided with Velcro material for attaching a sheet of sandpaper or sand cloth

thereto. This sandpaper or sand cloth may need to be provided with mating Velcro material. It is otherwise also possible to make use of a supporting element into which the Velcro material is already integrated.

The coupling elements may be connected to a base, and the base may be releasably connected to the carrier.

The sanding element may have the form of a closed sanding belt which extends around the combination of coupling elements and base. It hereby becomes possible to make use of annular belts of sanding material, wherein these may be mounted with a simple operation. The use of a support for the sandpaper or sand cloth between the coupling elements may be unnecessary here. Replacement of the sandpaper may be easier.

The base may be connected releasably and rotatably to the carrier in order to facilitate sanding. In addition to rotation of the sanding element, this measure provides the option of exchanging the sanding element, together with the base and the coupling elements, for a similar combination with a different configuration or shape. Other processing elements may moreover be placed, such as a rigid sanding element or an element adapted to carry out a process other than sanding.

In addition, the base may be releasable in at least one angular position of the carrier. Use is, for example, made of a configuration of a bayonet fitting, wherein the fitting is in the locked position in an active position of the sanding element.

The present invention further relates to a sanding machine that includes a sanding sole and a sanding device, wherein the carrier of the sanding device may be formed by the sanding sole of the sanding machine or the sanding device may be releasably connected to the sanding sole of the sanding machine.

Example embodiments of the present invention are explained in more detail below with reference to the appended Figures.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic perspective view of a sanding machine according to an example embodiment of the present invention.

Figure 2 is a detail view with exploded parts of a part of the sanding machine illustrated in Figure 1.

Figure 3 is a schematic perspective view of a sanding machine according to an example embodiment of the present invention.

Figure 4 is a detail view with exploded parts of a part of the sanding machine illustrated in Figure 3.

Figure 5 is a schematic perspective view of a sanding device according to an example embodiment of the present invention.

Figure 6 is a schematic perspective view of a sanding device according to an example embodiment of the present invention.

Figure 7 is a schematic perspective view of a sanding device according to an example embodiment of the present invention, in which a part is removed.

Figure 8 is a view corresponding with Figure 7, with all parts shown.

Figure 9 is a side view of the releasable part of the sanding device illustrated in figures 7 and 8.

Figure 10 is a perspective top view of the releasable part of the sanding device illustrated in Figures 7 and 8.

Figures 11A to 11G show different variants of sanding elements which are connected releasably and rotatably to a carrier.

DETAILED DESCRIPTION

Figure 1 illustrates a sanding machine designated as a whole with 1, which is provided with a sanding sole 2. In the manner of a conventional sanding machine, this sanding sole 2

may be provided with a piece of sandpaper or sand cloth for performing a surface sanding operation. Sanding machine 1 is herein adapted to drive sanding sole 2 such that it executes a reciprocal movement. This may be a movement back and forth but may also be a rotating movement, or a combination of both types of movement.

A carrier 3 is fixed onto sanding sole 2. This carrier 3 is connected to sanding sole 2, for example, by a snap connection or as according to the method described in European Published Patent Application No. 1 166 963.

In addition to carrier 3, the sanding device for sanding machine 1 illustrated in Figures 1 and 2 includes a sanding element 9, 10 and two coupling elements 8 with which sanding element 9, 10 is coupled to carrier 3.

Carrier 3 is provided with two hinge constructions 4 extending in parallel as illustrated in Figure 2. Each of these hinge constructions 4 is formed by a retaining element 5, which is formed integrally with carrier 3 and a shaft 6. Shaft 6 is provided with protruding end parts 7 which may be received by a snap connection in recesses 29 arranged in retaining elements 5. Hinges 6 are formed integrally with coupling elements 8.

The two coupling elements 8 are coupled to a sandpaper supporting element 9 manufactured from flexible material. This sandpaper supporting element 9 is connected for this purpose to coupling elements 8 by, for example, gluing or another type of connection. On its outside, the sandpaper supporting element 9 is provided with Velcro material. Sandpaper 10 may be arranged on the sandpaper supporting element 9 by a Velcro connection.

As illustrated in Figure 1, it is possible to sand a curved surface, for example, a pipe 11, using the thus formed sanding device.

The majority of the workpieces to be sanded by such a sanding machine 1 have a cylindrical surface. It is therefore

attractive, as in the above elucidated embodiment, for hinges 4 to extend parallel to each other. Sanding element 9, 10 will take on the form of the sanding surface as a result of the movable connection between sanding element 9, 10 and carrier 3, in that the ends of coupling elements 8 coupled to sanding element 9, 10 may move relative to each other. The flexibility of supporting element 9 and sanding machine 10 also contribute hereto.

Although this will occur less frequently in practice, it is also possible to sand non-cylindrical objects with such a sanding device. It is possible to consider having the hinges 6 extend at a certain angle for this purpose.

Figures 3 and 4 illustrate another example embodiment of the present invention, which relates principally to the manner in which the sandpaper is attached.

As illustrated in Figures 3 and 4, use is made of an annular piece of sandpaper 12 which is placed round a combination 13. This combination 13 is formed by a base 14 to which two coupling elements 16 are connected by hinges 15. The dimensions of the annular piece of sandpaper 12 and combination 13 are such that, in the arrangement illustrated in Figure 4, sandpaper 12 is as flat as possible at the position of the sanding surface. In this arrangement, the combination 13 with sandpaper 12 arranged thereon is pushed into a clip 17 arranged on carrier 3. Clip 17 fixedly clamps the combination with the sandpaper 12 arranged therearound.

As a result of the combination 13 being integrally formed, coupling elements 16 will have a preferred position. They will be urged into this preferred position. A stretching force is hereby exerted on the part of sanding belt 12 adapted for the sanding operation. In the foregoing example embodiment, there is no such preferred position. This may be arranged as desired. The relevant device(s) may be provided for this purpose.

An advantage of the example embodiment illustrated in Figure 4 is that sandpaper 12 may be used more completely. After the uppermost piece of sandpaper 12 has been used, the annular sandpaper 12 may be rotated and a subsequent piece of sandpaper 12 may be used.

The example embodiment illustrated in Figure 5 includes a carrier 3 in the form of a sanding sole for releasable connection to a sanding machine, on which sole a base 14 is rotatably mounted. On base 14 are arranged two coupling elements 16 which are manufactured from flexible material. At least the distal ends of these coupling elements 16 are connected to a sanding element. In this example embodiment, the coupling elements 16 and base 14 are arranged integrally.

Base 14 is provided with a shaft which extends into carrier 3 perpendicularly of carrier 3. Base 14 is provided with a nose which engages under a substantially L-shaped edge 18 fixed to carrier 3. This edge 18 extends in a circular arc.

Base 14 is secured on carrier 3 in that the nose protrudes below L-shaped edge 18. Base 14 may be removed by rotating the nose from under edge 18. Base 14 may be locked on carrier 3 in diverse angular positions, e.g., by conventional locking devices, such as an elevation 25 as illustrated in Figure 5 in co-action with a corresponding recess in the bottom of base 14. The action of a bayonet fitting is obtained here.

Rapid exchange of the base 14 with the sanding element arranged thereon is thus possible, wherein a good connection to base 14 is obtained despite this advantage, this being important in respect of the transfer of forces during sanding. This fastening otherwise provides the option of rapid replacement of base 14 by a base on which is placed a sanding element with a different configuration. As well as a flexible sanding element, it is thus possible, for example, to apply a substantially rigid sanding element with a form adapted to the

operation to be performed, such as a concave, convex, folded form or with a sharp point, etc.

Advantages obtained with the above discussed example embodiment may also be obtained with the example embodiment illustrated in Figure 6.

In the example embodiment illustrated in Figure 6, the reference numeral 3 designates the sanding sole of the sanding machine since this fulfills the function of carrier 3. A clamping element 20 is connected rotatably to sanding sole 3. Clamping element 20 is mounted for this purpose on carrier 3 by a shaft 21. The clamping element is provided with a U-shaped end part 22 and a pair of ridges 23. Ridges 23 continue as side walls 27 and 28, of which the wall 28 is indicated broken-away in Figure 6.

A base 14, on which a sanding element may be mounted via coupling elements or an element for performing another type of process may be directly mounted, is provided with two noses 24, 26. In the position of clamping element 20 illustrated in Figure 6, the first nose 24 may be pushed into U-shaped end part 22 and the second nose 26 may be placed between ridges 23. The thus obtained assembly may then be rotated until the second nose 26 comes to lie under retaining edge 18 and is secured thereby.

Figure 7 illustrates a further example embodiment of a sanding device. Use is once again made here of a carrier 3, on which is arranged a bearing 30. Bearing 30 is semicircular. An L-shaped edge 18 is further placed on carrier 3, as in the foregoing example embodiment. Recesses 31 are arranged in the upper side of the L-shaped edge.

In the present example embodiment, the base 14 takes the form of a flat plate 32 which is provided at one end with a disc-shaped part 33. This disc-shaped part 33 fits into bearing 30. The other end 41 of plate 32 extends under the L-shaped profile 18. A connecting piece 34 is arranged on plate 32.

The construction of the assembly described up to this point is such that from a separate position the base 14 may first be placed with its disc 33 into bearing 30 and may then be rotated in the bearing until distal end 41 of plate 32 is arranged under L-shaped profile 18 and is retained there. An arrangement obtained in this manner is illustrated in Figure 7.

Three recesses 31 are arranged in the upper side of L-shaped edge 18 in order to fix base 14 in one of three possible positions. Arranged on connecting part 34 is a tongue 35 which is provided on its front bottom side with a protrusion 36 which fits into each of the recesses 31. For this purpose, tongue 35 has a resilient form, so that protrusion 36 may be placed into any of the recesses 31. The distal end of tongue 35 may be moved upward again using the fingers, so that protrusion 36 is lifted out of recess 31 and base 14 may be rotated.

As illustrated in Figure 8, a sandpaper carrier 38 is arranged on connecting part 34. This may be placed releasably on connecting part 34 but may also be arranged fixedly. Sandpaper is attached to sandpaper carrier 38. Sandpaper carrier 38 may be a rigid element but may also be manufactured from flexible material so that the outer edges thereof may move relative to each other during sanding, and the curvature of sandpaper carrier 38, including the sandpaper, adapts to the workpiece for sanding.

It is further pointed out that sandpaper carrier 38 is placed obliquely relative to carrier 3. This means that the distance between carrier 3 and sandpaper carrier 38 is greater in the vicinity of tongue 35 than in the vicinity of bearing 30. In other words, the lower and upper edge of connecting part 34 do not extend parallel to each other. This measure has been taken to provide better execution of determined sanding operations. Sanding machine 1 may then be handled

more easily while maintaining full contact between sandpaper carrier 38 and the workpiece.

Figure 9 further illustrates the separate part of the sanding device, i.e. the combination of sandpaper carrier 38 and base 32, 34 on which it is mounted.

Figure 10 illustrates the component of Figure 9 from above. Here is illustrated that on the distal end 41 of plate 32, a chamfering 39 is arranged for easy movement of plate 32 to a position under the L-shaped edge 18. Slots 40 are further arranged in order to form resilient tongues providing practically immobile placing of plate 32 under edge 18.

It should be apparent that base 32, 34 may be readily exchanged for a base on which a different sanding element or a different processing element is placed. Different variants are illustrated in Figures 11A to 11G. Illustrated successively are a rigid sanding element of square (Fig. 11A), V-shaped (Fig. 11B), triangular (Fig. 11C), finger-like (Fig. 11D), concave (Fig. 11E) and convex (Fig. 11F) form and a flexible sanding element according to the example embodiment illustrated in Figures 1 and 2 (Fig. 11G).

It should be apparent that numerous variations may be made to the example embodiments illustrated and described herein.